



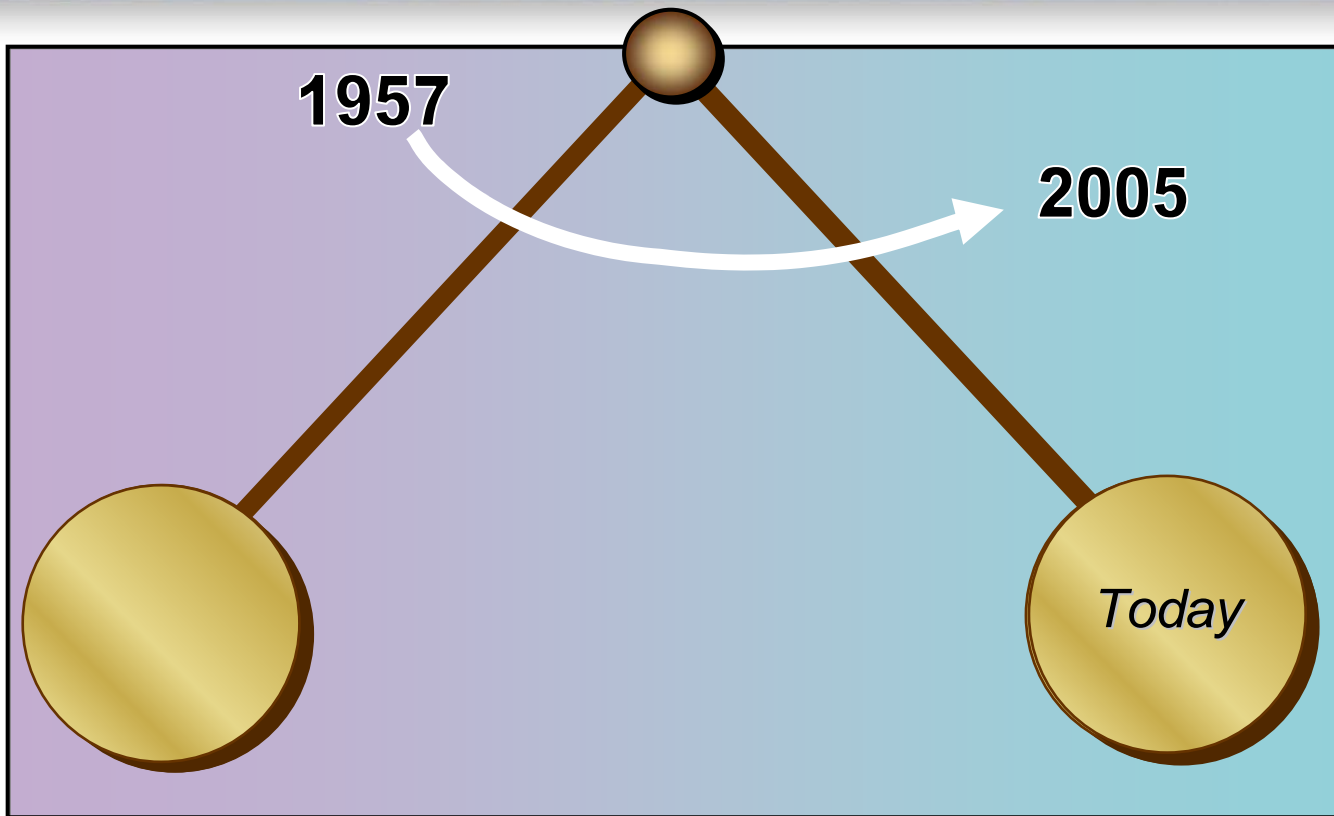
US Defense Space Acquisition Problems and Potential Solutions

*Presented to the Defense Acquisition
Performance Assessment Project*

*Pete Rustan
September 15, 2005*



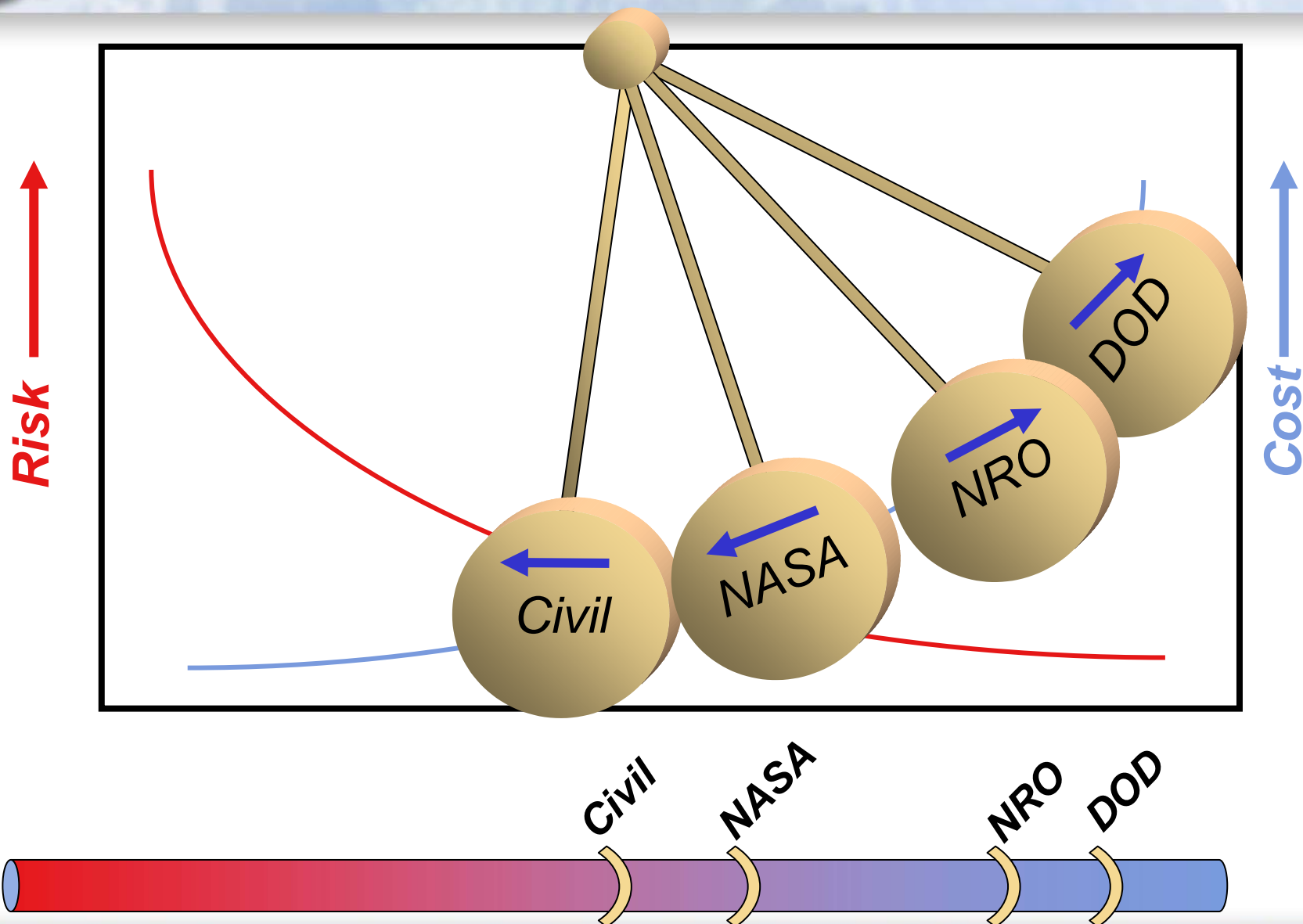
Program Management Pendulum



<i>Technology-Driven</i>	↔	<i>Requirements Driven</i>
<i>Risk Management</i>	↔	<i>Risk Averse</i>
<i>Streamlined Mgmt Processes</i>	↔	<i>Process Driven Mgmt Practices</i>
<i>Skunkworks</i>	↔	<i>Layers of Review</i>
<i>Budget Flexibility</i>	↔	<i>Budget Constraints</i>

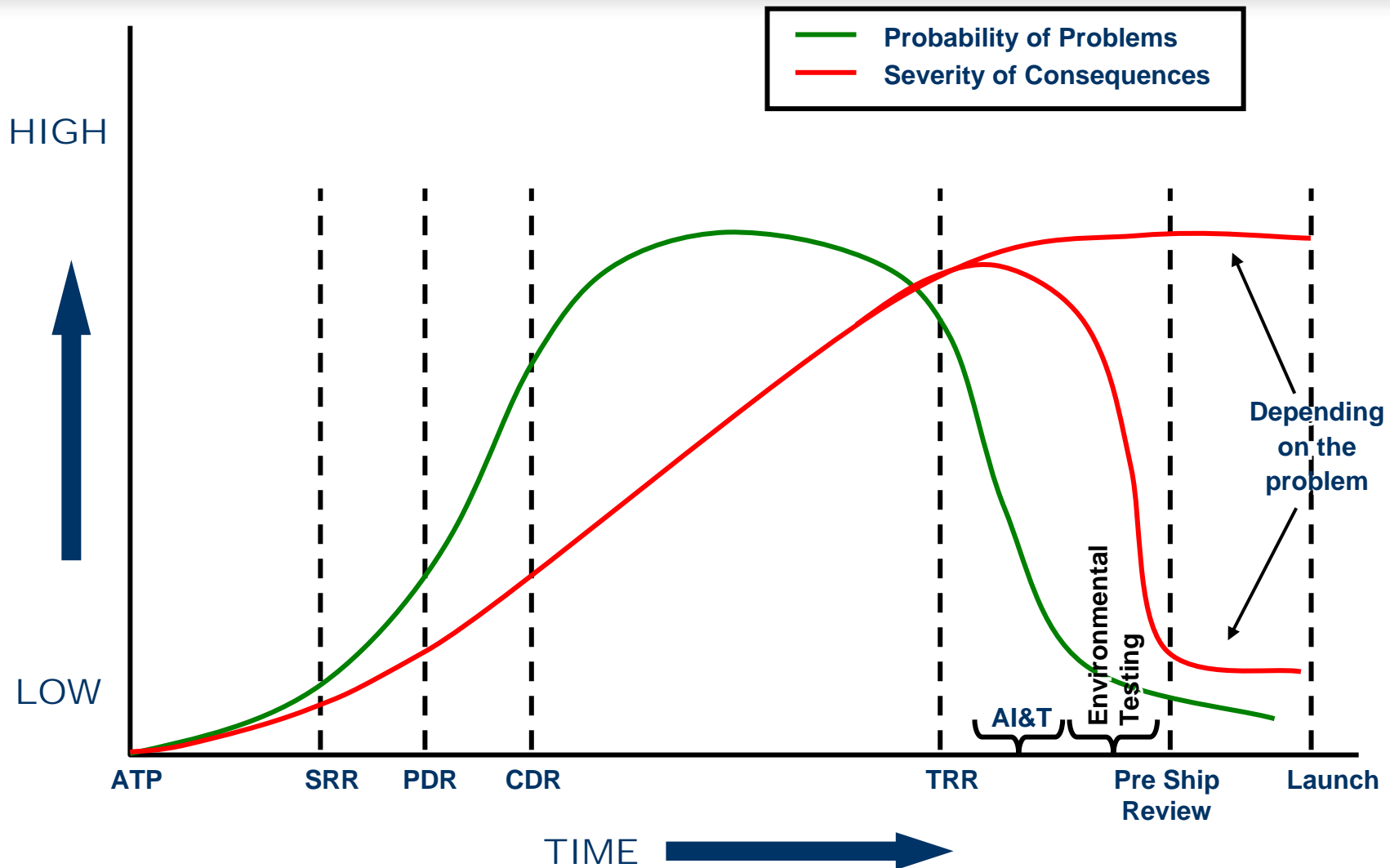


User's 2005 Risk Tolerance





Space Acquisition – Problems And Consequences Over Time





The Box We've Put Ourselves In

Schedule

- Minimum 5 to 7 years, ATP to launch, often 10 years
- Lengthy and complicated proposals
- Parts availability
- Detailed and lengthy testing

Cost

- Hundreds of millions or billions of dollars per satellite
- System engineering difficulties
- Part survivability

Performance

- Extensive and detailed requirements
- Long satellite life requirement
- Scarcity of new technology innovations

Risk

- Slow schedule drives cost
- Added requirements drive cost
- Low risk implies no innovation
- Space components small production capability

Can we reform acquisition processes to move to lower cost while achieving mission assurance?



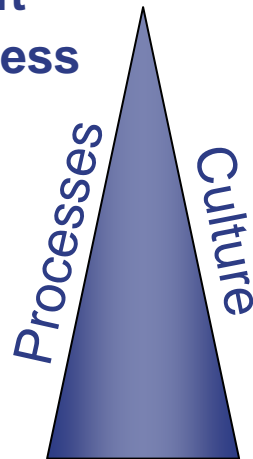
Culture, Processes And Technology



Where We Are

Present approach is dominated by:

- An unconstrained requirements driven process
- Low rate of new technology insertion being performed after ATP
- Integration of multiple missions on each spacecraft
- Mission success
- Risk Averse



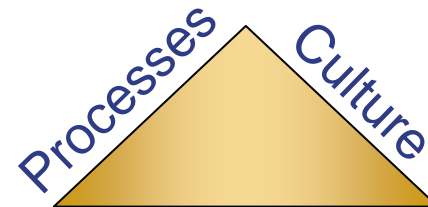
Technology

(A Culture and Process Driven Strategy)

Where We Need to Be

We must focus on:

- Cost as an Independent Variable (CAIV)
- Technology opportunities to develop enhanced capabilities performed prior to ATP
- Single or synergistic missions only integrated on each spacecraft
- Mission success using streamlined management procedures
- Active Risk Management



Technology

(A Balanced Approach)



Ten Major Space Defense Acquisition Problems And Potential Solutions



#1 Overly Detailed And Inflexible Requirements

- **Problem:** Initially in the space era, we built capability-driven systems that provided the best our technologies could offer. During the last 15 years, however, we have swung the pendulum to writing detailed requirements that our space systems should meet.
- **Solution:** We should develop more discipline to understand the needs of the stakeholders. But if problems develop, we should have the flexibility to trade performance in lieu of increased cost.



#2 Proceeding To Acquisition Before Technologies Mature

- **Problem:** Enthusiastic stakeholders often start programs to build a spacecraft before the critical technologies have matured. As a result, we often spend years developing the technologies as part of acquisition, with big cost penalties.
- **Solution:** We should build critical payload subsystems first under cost-plus contracts. Then, the more conventional spacecraft development and integration can be performed resulting in an accelerated schedule at lower cost.



#3 Inflexible Budgets

- **Problem:** It is difficult to manage acquisition without the budget flexibility to solve problems as they develop. Program managers are trapped by very specific budget constraints and limited in money that can be transferred between programs. Since contractors feel pressured to provide optimistic budget proposals to win programs, this lack of budget flexibility prevents us from solving problems as soon as we observe early symptoms. Continuing changes by Congress and/or program offices to program budgets and schedules have a serious detrimental impact on program cost.
- **Solution:** We need execution-year reserves for space acquisition programs, but the reserves should be used judiciously by program managers and only with approval of the program manager's supervisor.



#4 Requirements Creep

- **Problem:** Since there are many users of our space systems today, and it takes many years to build the systems, the situation changes and stakeholders often request increased capabilities during the acquisition cycle.
- **Solution:** Even though these stakeholders' motives are laudable, program managers should resist their desires to increase capabilities in the acquisition cycle. Shortening the acquisition cycle will discourage program changes.



#5 Management Experience Shortfalls

- **Problem:** We tend to compensate for our present paucity of management experience by significantly increasing the workforce numbers to obtain the expertise through collective thinking, prescribed processes and committee recommendations. Contractors feel compelled to match one-for-one the size of their respective government program offices, driving program costs up considerably.
- **Solution:** We should hire greater expertise in government, minimize personnel rotations, reduce the size of the government program offices and support contractors and empower program managers to make decisions and hold them accountable.



#6 Poor Management Of Subcontractors

- **Problem:** It takes months or years for a prime contractor to finalize specifications and put subcontractors to work. In many cases, prime contractors fail to perform a detailed system engineering analysis during the first few months of program execution, and some requirements are inadvertently not communicated to subcontractors.
- **Solution:** The government should require strict requirements flowdown and finalization of all subcontractors within six months after ATP. The prime contractors should fully integrate and track subcontractor's management plans and acquisitions schedules into the Prime's master schedule. Companies should consider management of subcontractors a step in career development instead of a business support function.



#7 Uncertainties About Electronic Components

- **Problem:** With the tremendous advances in electronics in the last 15 years, great numbers of traditionally separate components are now integrated into more complex single parts. Since these components are evolving quickly, the companies involved tend to go out independently to obtain their electronic components from the industrial base without compliance checks. Flawed manufacturing or immature processes are often found only late in system testing.
- **Solution:** Government should work with industry to ensure a vital component of the industrial base by continuously maturing manufacturing processes. Government should prevent overdependence on any one vendor.



#8 New Spacecraft For Each Set Of Requirements

- **Problem:** In spite of the continuing demand for satellites to meet defense, intelligence and commercial applications, manufacturers have a propensity to build a different spacecraft for each specific application. Even though all spacecraft use the same basic bus support functions (power, structure, attitude, command and control, thermal, propulsion and communication) and some of the components are the same, using off the shelf components is not a standard procedure.
- **Solution:** We should encourage the development of standard interfaces, modular approaches and plug-and-play configurations. We should also emphasize distributed satellite constellations and production assembly lines.



#9 Forgetting About Ground Services

- **Problem:** Too often, we isolate acquisition from the organizations responsible for exploitation and dissemination of the product. We should carefully analyze the questions we are trying to answer, determine if space is the best medium to obtain that information, and proceed to perform an end-to-end analysis of all the elements required to convert the collected data into information for decision-making.
- **Solution:** Ensure the ground infrastructure required to control the spacecraft, and process and distribute the resulting information, is fully evaluated and is an integral part of the acquisition process. Space system producers should share end-to-end responsibility for system performance.



#10 Integrating Multiple Non-Synergistic Missions For Each Spacecraft Procurement

- **Problem:** Spacecraft cost is directly related to the complexity of the system being built. Multiple non-synergistic functions drive program costs exponentially. Since we have few new starts, and launch vehicle costs are high, there is a tendency to integrate mutually exclusive requirements on the same spacecraft.
- **Solution:** Meet user requirements by building distributed architectures using constellations of satellites. Put non-synergistic missions on separate spacecraft, using plug and play and standard interfaces. We must also work to revitalize the small launch industry.



We Must Do Things Differently

	<u>Issue</u>	<u>Govt</u>	<u>Contr</u>	<u>Remarks</u>
Technology	Immature Technology	√		Should be TRL 6 before building
	SV Size/Weight/Capability	√	√	Centralized vs constellation options
Culture	Too Many People	√	√	Too much “support”
	Unconstrained Rqmts	√		Independent of cost
Processes	Things to do by PDR	√	√	Ensure “paper” is ready for build
	Insight Versus Oversight	√		PM must be in-charge
	Value Proposition	√		Analyze capability versus cost
	Historical Cost Models	√	√	Accepts previous mistakes
	Parts Management	√	√	Govt must ensure proper mgmt
	Sub-contract Management	√	√	Contractor must manage subs
	Inflexible Budget	√		Reserve allocated for all programs
	Rapid Prototyping	√		Utilize urgency to solve new problems

I strongly believe satellite cost can be reduced by at least 50% by addressing culture and process issues



Summary

- The culture and processes that we have come to accept as the de facto standard operating procedure do not represent the best framework for the enhanced capabilities that we need to provide to the military and the IC.
- We must transform the ways we do business, become much more proactive and effective in satellite acquisition program management. Our challenge is to return more to the nation for resources invested.
- To rise to this challenge and continue to be the leading space faring nation, I think we must modify, streamline, or eliminate some of the processes and change the culture to which we have become accustomed during the last 15 years. We must learn from our mistakes, galvanize our efforts, and move forward to transform our space acquisition processes now.